UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/889,518	08/27/2001	Paul Walter Baier	449122009400	4278

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ART UNIT	PAPER NUMBER
2631	

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11

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

	Application No.	Applicant(s)
Office Action Summary	09/889,518	BAIER ET AL.
	Examiner	Art Unit
	Khanh Tran	2631

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _03 February 2003_ .

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-5,8-13,16-22 and 27_ is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-5,8-13,16-22 and 27_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _10 February 2003_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

   If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☒ All b)☐ Some * c)☐ None of:

   1.☒ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____ .

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

   a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)   4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)   5) ☐ Notice of Informal Patent Application (PTO-152)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .   6) ☐ Other: .

DETAILED ACTION

1. The Amendment B filed on 02/03/2003 has been entered. Claims 1-5, 8-13,

16-22 and 27 are pending in this Office action.

Response to Arguments

2. Applicant's arguments, see page 3, line 18 through page 4 of the amendment

filed on 02/03/2003, with respect to the rejection(s)of claim(s) 1-5, 8-13, 16-22 and 27

have been fully considered and are persuasive under U.S.C. 102(e) and 103(a).

Therefore, the rejection has been withdrawn. However, upon further consideration, a

new ground(s) of rejection is made in view of Smith et al. U.S. Patent 6,009,124, Van

Heeswyk et al. U.S. Patent 6,333,947 B1 and Raleigh et al. U.S. Patent 6,144,711.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by
another filed in the United States before the invention by the applicant for patent or (2) a patent
granted on an application for patent by another filed in the United States before the invention by the
applicant for patent, except that an international application filed under the treaty defined in section
351(a) shall have the effects for purposes of this subsection of an application filed in the United States
only if the international application designated the United States and was published under Article 21(2)
of such treaty in the English language.

3. Claims 1-2, 17 and 27 are rejected under 35 U.S.C. 102(e) as being

anticipated by Smith et al. U.S. Patent 6,009,124.

Regarding claims 1 and 27, according to the teachings of Smith invention, in

column 3, lines 23-36, an interference reduction circuit, which is coupled to an adaptive

sectored antenna, selectively moves the sector of coverage to alternative configurations

to reduce the external interference based on interference indication signals which are

the BER (bit error rate) and the RSSI (Received Signal Strength Indicator). Hence,

Smith invention utilizes the interference indication signals to steer the antennas to

receive and, of course, transmit data and the quality of data transmission would be

improved by achieving spatial selectivity to focus on one of the users and reject signals

from all other users in the environment. Figure 6 shows a high data rate communication

system including base stations 602 and 604 wherein each base station employs an

adaptive sectored antenna 614 or 624 and a beam steering state machine 200. Figure 8

illustrates the processing steps for a protocol between the first base station 602 and the

second base station 604. In processing step 800, the first base station transmits an ID

signal to a second base station. The second base station comes out of standby mode

and transmits an antenna training sequence to the first base station. Hence, the first

base station processes the training sequence, by using a signal-processing algorithm,

to obtain quantitative information about the second base station. In processing step 808,

the first base station and the second base station adaptively steer their respective

arrays to achieve minimum BER and a maximum RSSI that are interference indication

signals. Hence, as recited again, the quantitative information about the received

interference indication signals are utilized to steer the antenna and, of course, is used to

generate a directional pattern for transmission at the first base station.

Regarding claim 2, the measurement of RSSI signal as taught in Smith invention

should be a good estimate of the transmitted user data. Hence, the RSSI measurement

could be part of the first signal-processing algorithm.

Regarding claim 17, one embodiment of Smith et al. invention is a

communication between two base stations, a single user detection case.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 3-5 and 18-20 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Smith et al. U.S. Patent 6,009,124 as applied to claim 1 above, and

further in view of Van Heeswyk et al. U.S. Patent 6,333,947 B1.

Regarding claim 3, Smith et al. does not explicitly provide an estimate of the

characteristics of the radio channels. Nevertheless, the RSSI signal measurement

inherently embeds the radio channel characteristics. As well known in the art, channel

characterization is always performed at the receiver to take into account estimated

channel response. Also, as demonstrated in Van Heeswyk invention, in figure 6, an

interference cancellation circuit 115 includes a pilot channel detection and air interface

channel characterization 200 to perform an estimate of an air interface channel over

which the signal components are transmitted. Although Van Heeswyk invention does

not show utilization of interference information to improve the transmission quality at the

receiver, Van Heeswyk teaches a method of canceling interference in CDMA signals

wherein an air channel is characterized using a pilot signal. The information of channel

characterization is directly related to the computation of the RSSI signal. Therefore,

implementing an interference cancellation circuit as taught by Van Heeswyk into Smith

et al.'s high data rate communication system for reducing interference would have been

obvious to one of ordinary skill in the art.

Regarding claim 4, with the foregoing same reasons, Van Heeswyk further

discloses digitized baseband pilot channel component reconstruction 202 subtracted

from the delayed digitized baseband component signals 119 to recreate corrected

digitized baseband component signals 207, see figure 6. Hence, Van Heeswyk teaching

is considered a second signal-processing algorithm to reconstruct the user signals as

stated in the claim.

Regarding claim 5, with the foregoing same reasons, Van Heeswyk further

discloses, in figure 9, an amplitude weighting function 270 is used to affect the

estimated amplitude for the particular path. The ouput of the amplitude weighting

function 270 is an estimate of the particular digitized baseband pilot channel

component. The result can be applied to the subtraction circuit 205 as recited in claim 4

to reconstruct the received user signals. Hence, this portion of Van Heeswyk teachings

can be considered to be part of a second signal-processing algorithm as stated in the claim.

Regarding claim 18, Van Heeswyk's invention is for multi-user system as illustrated in figure 6.

Regarding claim 19, Van Heeswyk's invention is for multi-user system employing RAKE receiver as illustrated in figure 7.

Regarding claim 20, forward error correction encoding/decoding are inherently employed in the communications system.

5. Claims 8-13, 16, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith et al. U.S. Patent 6,009,124 as applied to claim 1 above, and further in view of Raleigh et al. U.S. Patent 6,144,711.

Regarding claim 8, Smith et al. does not teach the second signal processing algorithm includes a forming of the spatial covariance matrix of the received interference signals. Nevertheless, Raleigh et al. invention is directed to a space-time signal processing system, taking advantage of multiple transmitter antenna elements and/or multiple receiver antenna elements. The system, as illustrated in figure 14, operates with an efficient combination of substantially orthogonalizing procedure (SOP) that decomposes the time domain space-time communication channel that might have intersymbol interference (ISI) into a set of parallel, space-frequency, SOP bins wherein the ISI is substantially reduced. Raleigh et al. further teaches a preferable measure of the interference present is the so-called interference spatial covariance matrix, which

describes interference correlation across space for each frequency bin. The forming of

covariance functions can be considered to be part of the second signal-processing

algorithm. Even though Raleigh et al does not show utilization of interference

information to improve the transmission quality at the receiver, nevertheless, the

forming of an interference spatial covariance matrix as taught by Raleigh et al. fits well

in the teachings of Smith et al. for combating multi-path interference; therefore, the

combination of both teachings would have been obvious to one of ordinary skill in the

art.

Regarding claim 9, Raleigh et al. invention is directed to a *"space-time"* signal

processing system, taking advantage of multiple transmitter antenna elements and/or

multiple receiver antenna elements. Hence, the forming of covariance functions of the

received interference signals is obviously both spatial and temporal. The forming of

covariance functions can be considered to be part of the second signal-processing

algorithm.

Regarding claim 10, the forming of covariance functions of the received

interference signals obviously includes the total covariance functions of the received

interference signals and the process can considered to be part of the second signal-

processing algorithm.

Regarding claim 11, Raleigh et al. discloses that the interference covariance

matrix contains information about the average spatial behavior of interference. It should

be very well known in the art averaging is always performed over a period of time to

better characterize noise or interference. Therefore, it would have been obvious that the

"*space-time*" signal processing system as taught by Raleigh et al. would estimate the

spatial,temporal and/or total covariance functions by finite temporal averaging over the

received interference signals.

Regarding claim 12, Raleigh et al. discloses forming an interference spatial

covariance matrix, which describes interference correlation across space for each

frequency bin. The eigenvalues of the matrix indicate the average power occupied by

the interference in each the eigendirection. The eigendirections that are associated with

large eigenvalues indicate spatial directions that receive a large amount of average

interference power. The eigendirections that are associated with small eigenvalues

indicate spatial directions that receive a less average interference power. Hence, the

information in the matrix includes estimated directions of incidence of the interference.

Regarding claim 13, Raleigh et al. teaches the forming of an interference spatial

covariance matrix, which describes interference correlation across space for each

frequency bin. The eigen-values of the matrix indicate the average power occupied by

the interference in each of the eigen-directions. Hence, the eigenvalues of the matrix

indicate the estimated average power occupied by the interference in each of the

eigendirection.

Regarding claim 16, since received signals are received interference signals,

forming a spatial covariance matrix of interference signals is also forming a spatial

covariance matrix of the received user signals. Hence, the process can be part of the

first signal processing.

Regarding claim 21, Raleigh et al. discusses, column 18, lines 8-45, a zero-forcing method for determining the weighting matrix in a matrix channel in one embodiment in the invention.

Regarding claim 22, Raleigh et al. discloses, in figure 3, the output of a receiver space-frequency processor 140 fed into Decoder and Deinterleaving block 150. A preferred embodiment includes a deinterleaver, a trellis decoder or a convolutional bit map decoder employing a scalar weighted Euclidean maximum likelihood sequence detector. Hence, the first signal processing algorithm can be considered based on the maximum likelihood estimation.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 703-305-2384. The examiner can normally be reached on Tuesday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi Pham can be reached on 703-305-4378. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3800.

KCT
April 25, 2003

CHI PHAM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600   4/29/03